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Inference of the Potential Predictability of Seasonal Land-Surface Climate from an Ensemble of AMIP Simulations

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The potential predictability (PP) of seasonal means of 11 land-surface variables is inferred from 6 realizations of the climate of the decade 1979-1988 performed with the ECMWF (cycle 36) model. Each realization starts from somewhat different atmosphere/land initial states, but proceeds with the same (AMIP) observed ocean boundary conditions. A seasonal variable is assumed to be potentially predictable to the extent that its interannual variability is associated with the temporal evolution of the ocean boundary conditions, rather than with the choice of initial conditions. Because the accuracy of the estimation of PP depends on the realism of the simulations, the variability of the modeled seasonal land-surface climate is validated against that of the NCEP reanalysis for the relevant time period.

As measures of PP, maps of zero-lag temporal correlations r(x,y) and time series of spatial pattern correlations s(t) are computed between the 15 independent pairs of seasonal anomalies of like variables available from the 6-member ensemble. Other measures of PP include the fraction of interannual variability of a land-surface variable that is explained by the ocean boundary conditions, and the time series of anomaly pattern correlations between like variables from the model and from the NCEP reanalysis.

The results imply that seasonal continental climate is consistently predictable only in the deep Tropics, especially over Amazonia, equatorial Africa, and southern Asia. In certain seasons, however, a few variables--notably surface pressure and temperature--appear to be predictable in some regions of North America and Eurasia. Moreover, in the aftermath of an ENSO event, the prospects for prediction of seasonal extratropical climate generally improve.

There also is a rather wide range in the overall PP of different land-surface variables. Surface temperature and pressure seem to be substantially more predictable than are precipitation and the surface fluxes of momentum, heat, and moisture; the predictability of radiative fluxes and soil moisture fall in an intermediate range.

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